have no such theory of the origin of objects which they supposed to be divinely produced. These facts being admitted, a different explanation suggests itself as being more probable. Such things usually come to light after torrential rains, and are thus naturally attributed to the thunder which accompanies the storm; and thus, besides flint axes, things like belemnites, fossil echini, and other quaintly shaped stones come to be revered like lithic artefacts.

It is also very doubtful if Mjölnir, the hammer of Thor, or the double-axe of Crete come within this category. The former was not a stone, but a forged metal axe, and the sanctity of the latter was possibly due to its use as a sacrificial implement. Poseidon's trident, again, was more probably the fish-spear which is the natural weapon of a sea-god.

In short, thunderstones, sacred fossils, sacred axes, and tridents may have their origin in general animistic conceptions, and their cult need not necessarily have arisen in any single centre or from any one train of thought. However this may be, the facts which the author has collected form a useful contribution to the study of primitive beliefs.

PURE AND APPLIED CHEMISTRY.

(1) *Problems in Physical Chemistry with Practical Applications.* By Dr. E. B. R. Prideaux. Pp. xii+311. (London: Constable and Co., Ltd., 1912.) Price 7*s*. 6*d*. net.

(2) *An Introduction to the Physics and Chemistry of Colloids.* By Emil Hatschek. Pp. ix+94. (London: J. and A. Churchill, 1913.) Price 2*s*. 6*d*. net.

(3) *Exercises in Gas Analysis.* By Dr. Hartwig Franzen. Translated from the first German edition (with corrections and additions by the Author) by Dr. Thomas Callan. Pp. vii+120. (London: Blackie and Son, Ltd., 1913.) Price 2*s*. 6*d*. net.

(4) *Theorie und Praxis der Grossgasindustrie.* By Rudolf Mewes. Band 1. Hälfte 1. Pp. xx+403. (Leipzig: H. A. Ludwig Degener; London: Williams and Norgate, n.d.) Price 18*s*. net.

(5) *Lehrbuch der Thermochemie und Thermodynamik.* By Prof. Otto Sackur. Pp. viii+340. (Berlin: Julius Springer, 1912.) Price 12 marks.

(6) *A Foundation Course in Chemistry.* For Students of Agriculture and Technology. By J. W. Dodgson and J. Alan Murray. Pp. x+244. (London: Longmans, Green and Co., 1913.) Price 3*s*. 6*d*. net.

(7) *Qualitative Determination of Organic Compounds.* By J. W. Shepherd. Pp. xvi+348. (London: W. B. Clive, 1913.) Price 6*s*. 6*d*.

(1) DR. PRIDEAUX has compiled a book of problems to serve as exercises for students in physical chemistry. The students who have worked through these will not be able to complain that they have not been exercised sufficiently, as the examples selected are very numerous and by no means all easy. They are, however, selected directly from the original literature, and so require the student to give real solutions to real problems, instead of the sham answers to fictitious questions which so frequently disfigure books of chemical calculations. The form in which this excellent material has been published is much less satisfactory. The table of contents suggests that the volume is composed of eight chapters, but these do not appear in the text. The reader is informed on each of the 300 pages that the book he is studying is called "Problems in Physical Chemistry," but no hint is given as to the topic that is dealt with on the pages at which the book is opened. The eight chapters run on continuously, and almost the only way to discover where one chapter ends and another begins is to turn back to the table of contents, for the chapters are not even allowed the luxury of beginning at the head of a fresh page. As no index has been supplied, the contents of the book are far less accessible than they need be to a reader who does not wish to work right through the book from beginning to end.

(2) A somewhat similar complaint may be made in reference to the reprint of Mr. Hatschek's articles on colloids. These are divided into ten chapters, but the chapter-divisions do not correspond in every case with the natural divisions of the subject, and subject-headings are not given, so that the classification of the material is not immediately obvious. This defect is, however, very largely remedied by the provision of a very detailed table of contents and two indexes. The book has the great merit of presenting in a simple and readable form all the leading points of a difficult and little-known subject. It may be commended without hesitation to the many readers who at the present day are being compelled by the pressure of technical or scientific problems to acquire some knowledge of "colloid chemistry."

(3) The English translation of Dr. Franzen's "Gas Analysis" forms a very useful introduction to the subject. Directions are given for carrying out forty-two exercises. Thirty-three of these have to do with the analysis of gases. The remainder, which are collected under the heading

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of "Volumetric Gas Analysis," are not exercises in the volumetric as contrasted with the gravimetric analysis of gases, but have to do with the analysis of solids and liquids by measuring the volumes of gas set free from them. In this section, for instance, are described the methods of estimating nitrates by the Lunge nitrometer and analogous processes. The book is presented in an attractive form, and carries out admirably the purpose of the author and translator to provide an introduction to the larger standard works on gas analysis.

(4) The German treatise on the theory and practice of the gas industry is a large work of which the present volume constitutes "I. Band, I. Hälfte." It includes the historical development of the principles of mechanics and physics, and the fundamental laws of thermodynamics. The subjects treated include isothermal and adiabatic compression, change of state, evaporation and boiling, viscosity of gases and vapours, specific heats, entropy of water-vapour and vapours used in refrigeration, radiation and conduction, flow of liquids, vapours, and gases. The chemist or engineer who is called upon to handle gases on a large scale will find in this treatise all that he is likely to require in the way of scientific preparation for his work.

(5) Prof. Sackur's "Text-book of Thermochemistry and Thermodynamics" deals with the fundamental laws of heat and of thermodynamics, which are then applied to many of the chief problems of physical chemistry. Thus we find chapters devoted to the theory of solutions, including van't Hoff's equations for osmotic pressure, and to chemical equilibrium based upon the equations of Helmholtz and of van't Hoff, and applied, for instance, to calculate the heat of ionisation from the change of the ionisation-coefficient with temperature. There are also chapters on the applications of thermodynamics to electrochemistry, thermoelectricity, and capillarity. The last chapters deal with radiation and with Nernst's "heat-theorem."

(6) The "Foundation Course in Chemistry" of Messrs. Dodgson and Murray is a well-written book of rather exceptional character. Special attention is paid to topics which have an interest for agricultural students, but this is by no means a drawback from the point of view of the general reader, as it gives an air of reality to the whole treatment of the subject. Structural formulæ are freely used for inorganic as well as for organic compounds, and a long chapter is given up to the chemistry of aliphatic compounds under the title "Paraffins and their Derivatives." The chapter on general principles gives a clear exposition of the doctrine of equivalents, but is scarcely an adequate exposition of the atomic theory, as Avogadro's hypothesis, which is the real basis of the modern system of atomic weights, is postponed to a later chapter, and is there treated only in the most incidental manner.

(7) The modern system of examinations is responsible for the development of a form of qualitative organic chemistry in which attempts are made to determine the nature of organic compounds without carrying out a combustion or quantitative analysis of any sort. This type of organic chemistry is only distantly related to the requirements of scientific or technical research, and has only a very limited range of usefulness. But if the student is aware of the supreme necessity of quantitative work there is little harm in allowing him to get some practice in recognising the qualitative properties of the chief radicles. Mr. Shepherd's book gives a scheme whereby the most important groups of organic compounds may be identified by qualitative tests; the scheme has been in use for some years, and has thus been adequately tested by actual work in the laboratory.

OUR BOOKSHELF.

A Text-book of Experimental Metallurgy and Assaying. By A. R. Gower. Pp. xiv+163. (London: Chapman and Hall, Ltd., 1913.) Price 3*s.* 6*d.* net.

THE new edition of this book conforms to the syllabus of the Lower Examination in practical metallurgy of the Board of Education. The first portion of the book consists of a series of experiments and explanations to illustrate the reactions occurring in various metallurgical operations, while the second part deals, in quite a satisfactory manner, with elementary assaying. It would have been an advantage if the book gave a little more guidance to the beginner, for very often he does not realise the economic character of metallurgy. For instance, a student sometimes thinks that as sodium carbonate is used in the laboratory as a flux for silica, therefore it would be charged into a blast-furnace smelting copper ores when silica has to be removed. The first chapter of this book may give some students an impression of this kind, for the substances classed as used in metallurgical operations are not all commonly so employed, although frequently used in experimental metallurgy and assaying. Then, again, in the chapter "Formation of Alloys," the theoretical quantities of the metals have been given, and no allowance made for loss in the case of volatile metals.

During the past twenty-five years the book has proved of use, and the present edition should be of assistance to those preparing for the Board

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